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## Production and value addition of climate-smart millets: An economic analysis in eastern dry zone of Karnataka, India

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### Abstract

This study was conducted with the aim of finding the profitability of selected millets (Little, Foxtail and Kodo millet) production and their value-added products in Kolar and Chikkaballapur districts of Karnataka state. The study was based on the primary data which was collected from 45 millet growing farmers and four women farmers who were involved in value-addition of millets. Data was analyzed using descriptive statistics and the results revealed that total cost of cultivation per acre was Rs. 14,135.54 for little millet, Rs. 14,228.41 for foxtail millet and Rs. 15,339.77 for kodo millet. The return per rupee of expenditure in small millets production was found to be Rs. 1.31 in little millet, Rs. 1.17 in foxtail millet and Rs. 1.20 in kodo millet. With respect to value added products, returns per rupee of expenditure was higher in organic millet malt with Rs. 2.11 followed by foxtail millet papad (Rs. 1.64). The returns per rupee of expenditure in case of value-added products were quite high. This study has shown the potential benefits of value addition which helps in increasing farmer's income significantly. Thus, farmers need to be encouraged to take up value addition at their farm level.

**Keywords:** Millets, cost of production, returns per rupee expenditure, value-added product

### Introduction

Millets are a group of small-seeded grasses, which are considered as a "Miracle grains" as they can grow under drought conditions and need much less water vis-a-vis other crops. Nowadays agriculture production is hardly met without any fertilizer and pesticide inputs but millets are an exception to this. Millets are generally grown as the rain-fed crops with less or no input of fertilizers for thousands of years (Devkota *et al.*, 2016) <sup>[1]</sup>. It is also interesting to note that the millets do not require any pesticide as they are less vulnerable to insect attack when compared with other major cereals (Goron and Raizada, 2015; Gupta *et al.*, 2017; Saxena *et al.*, 2018) <sup>[2, 3, 6]</sup>. These days millets are gaining importance as "climate smart crops" since they are sustainable solution for changing climatic conditions owing to their low water requirements, requiring only 300–400 mm of water (Ullah, 2017) <sup>[7]</sup>, tolerance to fluctuating temperature and assured yields. But due to green revolution the share of millets in our food basket declined and that created imbalance in diet. Now there is a need to diversify our food basket and this has led us to rediscover our own millets as they are great assets in the era of fast-food culture and a sedentary lifestyle.

Consumption of millets have shown to be beneficial against diseases like cancer and cardiovascular diseases, diabetes, high blood pressure, high cholesterol, inflammatory diseases, metabolic syndrome and Parkinson's disease (Rao *et al.*, 2018) <sup>[4]</sup>. Millets are more nutritious as compared to popular cereals like rice, wheat and maize and due to their many health benefits, Government of India notified millets as "nutri-cereals" in April 2018.

To create global demand for millets United Nations has declared the year 2023 as International Year of Millets. With this backdrop the study focuses to assess the profitability of climate smart millets production and their value added products.

### Materials and Methods

#### Data

The data for the study was collected from the sample farmers chosen from Kolar and Chikkaballapura districts in eastern dry zone of Karnataka, India. The small millets considered in the study includes little millet, foxtail millet and kodo millet.

Simple random sampling technique was employed to select, 45 farmers who are involved in small millet cultivation of which 15 are little millet farmers, 15 are foxtail millet farmers and 15 are kodo millet growing farmers. Four women farmers who are actively involved in the value addition of millets were selected to assess the cost and returns of value-added products in millets. The data on various aspects of millet production on farmers' fields was collected for the agriculture year 2019-20.

## Tools

### Cost of production

Cost of production is the total expenses incurred to produce a unit quantity of output.

### Gross returns

Gross returns were obtained by multiplying the total product with its unit price.

Gross returns = Price x total output sold

### Net returns

Net returns were obtained by deducting the total costs from the gross returns.

Net returns = Gross returns - Total cost

### Returns per rupee of expenditure

Returns per rupee of expenditure was calculated by dividing the gross return by the total cost.

Returns per rupee of expenditure =  $\frac{\text{Gross return}}{\text{Total cost of production}}$

## Results and Discussion

### Cost and returns of small millet cultivation

The cost of cultivation of little millet, foxtail millet and kodo millet in the study area are given in Table 1. Total cost of cultivation per acre of little millet was Rs. 14,135.54. The major cost item was variable cost (69.22%) and fixed costs constituted 30.78 percent of the total cost. Among different components of variable costs, cost of FYM was the prime cost constituting 25.06 percent of the total cost followed by labour cost (24.74%). Machine and bullock labour costs were the next major items in the variable cost accounting for 8.38 and 5.6 percent of the total cost, respectively. The major component of fixed cost was rental value of land which constituted 26.32 percent of the total cost.

Similarly, the total cost of foxtail millet cultivation was Rs. 14,228.41 per acre. Variable costs accounted for 72.51 percent of the overall cost, while fixed costs accounted for 27.49 percent. Labour cost was the most important component of variable costs, accounting for 29.76 percent of the overall cost (Rs. 4234.5). Farm Yard Manure, machine, and bullock labour costs were also significant variable costs, accounting for 22.56, 7.98, and 6.42 percent of total cost, respectively. The most significant component of fixed cost was the rental value of land, accounting for 23.34 percent of the overall cost. Total cost of cultivation per acre of kodo millet was Rs. 15,339.77 comprising of variable cost (68.05%) and fixed cost (31.95%). Farm Yard Manure was the major variable cost accounting for 26.09 percent of the total cost followed by labour cost (24.87%). Machine and bullock labour costs accounted for 6.78 and 4.69 percent of total cost, respectively. Rental value of the land (27.52%) was the major fixed cost component.

**Table 1:** Cost of cultivation of selected millets in the study area (Rs. per acre)

Cost / Item	Little millet	Foxtail millet	Kodo millet
1. Variable costs			
Seed	127.40 (0.9)	150 (1.05)	180 (1.17)
FYM	3543 (25.06)	3210 (22.56)	4000 (26.09)
Human labour	3498.50 (24.75)	4234.5 (29.76)	3815.5 (24.87)
Bullock labour	792 (5.6)	912 (6.42)	720 (4.69)
Machine labour	1184 (8.38)	1136 (7.98)	1040 (6.78)
Interest on working capital @ 7 percent	640.14 (4.53)	674.97 (4.74)	682.89 (4.45)
Total variable cost	9785.04 (69.22)	10317.47 (72.51)	10438.39 (68.05)
2. Fixed costs			
Land revenue	15 (0.11)	15 (0.1)	15 (0.1)
Depreciation	220 (1.55)	220 (1.55)	220 (1.43)
Rental value of land @ 20 percent of gross returns	3720 (26.32)	3320.4 (23.34)	4220.8 (27.52)
Interest on fixed capital @ 10 percent	395.50 (2.8)	355.54 (2.5)	445.58 (2.9)
Total fixed cost	4350.50 (30.78)	3910.94 (27.49)	4901.38 (31.95)
Total cost of cultivation	14135.54 (100)	14228.41 (100)	15339.77 (100)

**Note:** Figures in parentheses indicate percentage to total cost.

The gross returns include returns from the main product (grain yield) as well as returns from by-product (straw). The millet grains which are produced by the member farmers are sold to the federation. And the farmers are not incurring transportation costs, loading and unloading costs. The farmers are getting remunerative prices by selling millets to the federation. The grain yield obtained in case of little millet was 4.6 quintals per acre. The average cost of production was Rs. 3,072.94 per quintal. The gross returns per acre worked out Rs. 18,600, while the net returns after deducting total costs was Rs. 4,464.46 per acre. The returns per rupee of

expenditure was calculated to be 1.31. Foxtail millet grain yield was 4.19 quintals per acre with an average production cost of Rs. 3,395.80 per quintal. The gross returns per acre was Rs. 16,602 and the returns per rupee of expenditure was 1.17, with a net returns of Rs. 2,373.59 per acre over total cost. The grain yield of kodo millet was slightly higher than that of little and foxtail millet which accounted to 4.8 quintals per acre. The average cost of production per quintal was Rs. 3,195.79 and gross returns was Rs. 18,404 per acre. The net returns over total cost was Rs. 3,064.23 per acre and returns per rupee of expenditure was 1.20.

**Table 2:** Returns from production of selected millets in the study area

Returns	Little millet			Foxtail millet			Kodo millet		
	Quantity	Per unit price (Rs.)	Returns (Rs.)	Quantity	Per unit price (Rs.)	Returns (Rs.)	Quantity	Per unit price (Rs.)	Returns (Rs.)
Main product (q/acre)	4.6	3500	16100	4.19	3000	12570	4.8	3000	14400
By product (Tractor load)	1	2500	2500	1.26	3200	4032	1.43	2800	4004
Gross returns (Rs.)	18600			16602			18404		
Net returns (Rs.)	4464.46			2373.59			3064.23		
Cost of production (Rs./q)	3072.94			3395.80			3195.79		
Return per rupee of expenditure (Rs.)	1.31			1.17			1.20		

From the above results, it is clear that, for every one rupee of cost involved in cultivating small millets, the returns are more than unity and thus cultivation of small millets is profitable under rainfed condition with minimum external input usage. The results are in confirmation with the study of Satishkumar (2014) <sup>[5]</sup> where he found profitability of rabi jowar cultivation under rainfed conditions.

#### Estimation of cost and returns in value-added products of selected millets

Value addition in an agricultural commodity is a process of transforming the physical state or form of the product in a manner that results in the enhancement of the value of that commodity or product. Value added products of millets are having a great demand in the market because of their nutritional importance and low Glycemic index. Producing value-added products is one of the best strategies farmers can employ to improve their net profitability.

The cost and returns involved in production of these value-added products by women farmers are presented in table 3 and 4. In production of all the value-added products the variable costs included were cost of raw material, labour cost and interest on working capital. Fixed cost was considered as zero, as they have not purchased any specialized equipment for this purpose.

#### Cost and returns in organic millet malt preparation

The cost and returns of organic millet malt production is presented in Table 3. Average quantity of malt produced per woman farmer was 200 kg with total cost of production of Rs. 23,647. Gross returns realized was Rs. 50,000 and net returns was Rs. 26,353. The share of raw material cost was 89.23 percent of the total cost of production. Cost of foxtail, little

and kodo millets together constituted about 20.31 percent of the total cost of production. Among the raw material cost, cost of groundnut was the highest (16.91%) followed by cost of red rice (10.15%), cost of foxtail (6.77%), little (6.77%), kodo (6.77%), jaggery (6.77%), finger millet (4.23%), wheat (4.23%) and other raw material costs accounted for a minor part of the total cost. On the other hand, labour cost accounted for 4.23 percent of the total cost of production of malt. The total cost per kg of organic millet malt worked out to Rs. 118.24. The per kg gross returns realized was Rs. 250 and net return was Rs. 131.76, yielding a returns per rupee of expenditure of about Rs. 2.11 inorganic millet malt production.

#### Cost and returns of foxtail millet papad preparation

The cost and returns of foxtail millet papad production is presented in Table 4. Average quantity of papads produced per woman farmer in the study area was 600, with the total cost of production of Rs. 914.85. Gross returns realized was Rs. 1,500 and net returns was Rs. 585.15. The share of raw material cost was 55.20 percent of the total cost of production. Among the raw material costs, cost of foxtail millet was the highest (21.86%) followed by cost of Sabbakki (10.93%), labelling material (10.93%), packaging material (5.47%), cumin (2.19%), fuel (2.02%) and other raw material costs accounted for a small part of the total costs. On the other hand, labour cost accounted for 38.26 percent of the total cost of production of papad. The total cost of production for 120 papads worked out to Rs. 182.97. The gross returns came to Rs. 300 at a price of Rs. 2.5 per papad and net returns was Rs. 117.03, yielding a returns per rupee of expenditure of about Rs. 1.64 in foxtail millet papad production.

**Table 3:** Cost and returns of organic millet malt preparation

Sl. No.	Particulars	Total of 200 kg malt		Percent to total cost
		Quantity (kg)	Total cost (Rs.)	
1.	Variable cost			
a)	Raw Materials			
	Foxtail millet	40	1600	6.77
	Little millet	40	1600	6.77
	Kodo millet	40	1600	6.77
	Finger millet	40	1000	4.23
	Red rice	60	2400	10.15
	Pearl millet	40	1600	6.77
	Wheat	40	1000	4.23
	Jaggery	40	1600	6.77
	Groundnut	40	4000	16.91
	Green gram	4	260	1.09
	Soybean	2	80	0.34
	Peas	2	100	0.42
	Bengal gram	2	280	1.18
	Almond	1	600	2.54
	Cashew nut	1	700	2.96
	Cardamom	0.4	920	3.89
	Packaging material	200	200	0.84
	Labelling material	200	400	1.69
	Electricity (Sealing + grinding)		420	1.78
	Fuel		740	3.13
	Total raw material cost		21100	89.23
b)	Labour cost		1000	4.23
c)	Interest on the working capital at 7 percent rate of interest		1547	6.54
2.	Total cost of production		23647	100
3.	Returns			
	Price (Rs. per kg)		250	
	Gross returns (Rs.)		50000	
	Net returns (Rs.)		26353	
	Returns per rupee of expenditure (Rs.)		2.11	

**Table 4:** Cost and returns of foxtail millet papad preparation

Sl. No.	Particulars	Total of 600 papads		Percent to total cost
		Quantity (kg)	Total cost (Rs.)	
1.	Variable cost			
a)	Raw Materials			
	Foxtail millet	5	200	21.86
	Sabbakki	1.25	100	10.93
	Cumin (Jeera)	0.1	20	2.19
	Salt	0.05	1	0.1
	Chilli powder	0.05	5	0.55
	Packaging material	50	50	5.47
	Labelling material	50	100	10.93
	Electricity (Sealing + grinding)		10.5	1.15
	Fuel		18.5	2.02
	Total raw material cost		505	55.2
b)	Labour cost		350	38.26
c)	Interest on the working capital at 7 percent rate of interest		59.85	6.54
2.	Total cost of production		914.85	100
3.	Returns			
	Price (Rs. per papad)		2.5	
	Gross returns (Rs.)		1500	
	Net returns (Rs.)		585.15	
	Returns per rupee of expenditure (Rs.)		1.64	

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## Conclusion

The returns per rupee of expenditure in case of value-added products were quite attractive compared to return per rupee of expenditure in small millets cultivation. This shows that value addition in millets helps in increasing farmer's income significantly. Thus, farmers need to be encouraged to take up value addition at their farm level and the Government and agricultural universities through institutional support should extend training in value addition and marketing which will aid in empowering farmers.

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